Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
Establishing Just and Reasonable Rates for Local Exchange Carriers	)	WC Docket No. 07-135
	)	
High-Cost Universal Service Support	)	WC Docket No. 05-337
	)	
Developing a Unified Intercarrier Compensation Regime	)	CC Docket No. 01-92
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
Lifeline and Link-Up	)	WC Docket No. 03-109

COMMENTS OF
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[1] ITIF is a nonprofit, non-partisan public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington and in the states. Through its research, policy proposals, and commentary, ITIF is working to advance and support public policies that boost innovation, e-transformation and productivity.

Summary

The Information Technology and Innovation Foundation (ITIF) files these comments in response to the FCC's Notice of Proposed Rulemaking regarding the Universal Service Fund ("USF") and Inter-Carrier Compensation ("ICC") systems.[2] This subject has been under discussion for several years, and is overdue for action.

In brief, we believe that USF and ICC have met their goals and should be phased out within five years. We also believe that the FCC should design an effective program to bring broadband to unserved parts of the United States and to stimulate broadband adoption and use by Americans in these areas. The goal of this new plan is to stimulate investment in networks that will provide four Mbps broadband service at less than 250 millisecond latency to as many households as can be served in a cost-effective manner at present. As a practical matter, only terrestrial networks can meet this quality standard.

The definition of "cost-effective" is not a precise one, but refers to projects that require a small or modest sized subsidy to be carried out by a broadband provider, relative to the overall size of the Fund. Residents of non-cost-effective areas will rely on satellite-based broadband services until the advance of technology moves their places of residence into the "cost-effective" category. This broadband program should not be viewed as "reform of USF" as much as a fresh response to the Communications Act's goal of bringing "rapid, efficient…communication service with adequate facilities at reasonable charges"

[2] Connect America Fund, et al., Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking, WC Dkt. 10-90, et al., FCC 11-13 (rel. Feb. 9, 2011).

to all Americans.[3] Broadband should be the entire goal of the new universal service program going forward.

Broadband communications systems allow citizens to fully participate in the Internet and to enjoy emerging broadband applications, but the structures of investment, stimulus and support systems that serve broadband have little to learn from the historical USF in a positive sense. Consequently, the FCC should approach broadband access with a clean sheet, looking for new mechanisms, rather than viewing this new broadband program as a revision of USF that adapts current subsidies to a wholly different technology environment. This approach simplifies the problem and embraces productive solutions.

In particular, it will be helpful to identify approaches that don't require heavy levels of ongoing subsidy, impose technology lock-in, privilege incumbents, or support inefficient operations as USF does. Ultimately, the development and deployment of new technologies and new business models have more to offer broadband users than permanent government subsidy does. There will be geographic pockets in which subsidies will be a condition of service for some time, perhaps a considerable one, but they should be small and diminishing.

In particular, we recommend that the FCC develop a new universal service fund ("USF 2.0") to provide financing to innovative providers in two markets: A) The "first mile" local broadband services market; and B) The backhaul services "middle mile" market, in

[3] *Communications Act of 1934, as amended by the Telecommunications Act of 1996*, 1996, http://transition.fcc.gov/Reports/1934new.pdf.

areas where a considerable unserved population exists. These programs should be largely technology neutral, free of incumbent bias, cost-limited, and ideally time-limited.

Broadband services financed by USF 2.0 should be capable of reaching self-sufficiency with the exception of the new investment required for technology upgrades; it's appropriate for the fund to emphasize support for network technology upgrades but not operational expenses in other words. Emphasizing technology upgrades over operational subsidies will help provide rural Americans with an ever-improving level of broadband service while avoiding the skyrocketing costs and poor service that have characterized USF.

In most instances, reverse auctions are the most appropriate method for dispensing monies from the Fund to service providers. It's also appropriate for the Fund to support broadband adoption programs such as user education and equipment purchase support in order to stimulate the replacement of the legacy Public Switched Telephone Network (PSTN) by broadband in high cost areas on a time-limited basis.

The most important role the Fund can play across the board is to provide subsidies for new equipment in high cost areas that will improve service and reduce operational expenses. It's useful to think of the Fund as an investment program with limited use of subsidies rather than a subsidy program with limited tolerance for investment. For some high cost areas limited subsidies will be needed, (perhaps through low interest loans); in other areas with higher costs, deeper subsidies will be needed. For extremely high cost

areas, satellite will remain the broadband network of choice until such time as the economics of terrestrial networks make it practical to extend such networks further.

Discussion

Background

The Communications Act of 1934 created the FCC in order to "make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges."[4] The current Universal Service Fund and its administrative body, the Universal Service Administrative Company, were created by the Telecommunications Act of 1996.[5] As originally conceived, "rapid and efficient communication service" meant a PSTN fully compatible with and interconnected to PSTNs around the world. As we understand these terms today, they mean "constantly improving broadband networks fully joined with the Internet," and to some analysts, a mobile service option as well. We don't consider the provision of mobile network services *per se* a present goal of universal service, but rather consider 4G mobile networks a reasonable substitute for wireline for the provision of non-roaming broadband service. The Communications Act embraced wireless as well as wireline systems in its initial formulation of universal service, and that connection is even more sound today that it was in 1934.[6]

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[4] *Communications Act of 1934*, 1934, http://www.criminalgovernment.com/docs/61StatL101/ComAct34.html.
[5] *Communications Act of 1934, as amended by the Telecommunications Act of 1996*.
[6] Section 1 of the Act says: "For the purpose of regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges, for the purpose of the national defense, and for the purpose of securing a more effective execution of this policy by centralizing authority heretofore granted by law to several

The structure, technology, and interconnection regimes for broadband networks are radically different from the corresponding elements of the PSTN. Broadband is capable of supporting telephone service as an application, and of fully interconnecting with the PSTN. Consequently, the task of reforming USF amounts in part to upgrading standards for "rapid and efficient communication" and "reasonable charges."

The historical USF took the structure of the PSTN as given and attempted to inject subsidy where needed in order to extend it into markets that weren't self-sustaining. The task of reforming the financial element of USF amounts to replacing the PSTN with its high operating costs and extreme appetite for maintenance with a broadband infrastructure with lower costs and with a drive for constant improvement. Unlike the PSTN, which has largely employed the same technology for 80 years (with the exception of new digital switching systems hidden deep inside the PSTN fabric,) broadband consists of a number of distinct technologies in a constant condition of improvement. The task of reforming the USF's technology concept is to make it embrace change.

Interconnection

The PSTN consists of a number of independently operated networks which interconnect to each other in an *ad hoc* manner. ICC charges are meant to provide for a reasonable division of revenue for specific interconnections, but they're increasingly irrational, in part because they vary by regulatory jurisdiction (state, federal, or international) and in

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agencies and by granting additional authority with respect to interstate and foreign commerce in wire and radio communication, there is hereby created a commission to be known as the "Federal Communications Commission", which shall be constituted as hereinafter provided, and which shall execute and enforce the provisions of this Act." *Communications Act of 1934*.

part because they contain perverse incentives. Practices such as traffic pumping are a rational response to these incentives.

Broadband interconnection is much more uniform and rational, as it is provided by competitive firms and facilities specializing in interconnection and operating in a largely unregulated business context. When Broadband Network A shares an edge with Broadband Network B, they interconnect at a facility provided by one of the networks; when they don't, they interconnect at a carrier-neutral Internet Exchange or Ethernet Exchange created for the purpose of facilitating interconnection.

ICC is meant to provide financial support for high-maintenance rural networks, and divides funding in such a way that networks that carry information over short distances are most highly compensated. Broadband interconnection often takes place without money changing hands by "Settlement-Free Peering" (SFN,) and in other cases according to equitable division of labor where the network that transports information across the longer distance is more highly compensated. Arguably, broadband's bias toward distance in financial formulas is a proxy for installation and maintenance costs since broadband backbones employ uniform technology (optical fiber and MPLS.)

ICC has created a set of incentives toward high operational costs and limited investment. These incentives may have been appropriate for a technology regime that resists change, but they are completely inappropriate for one that embraces progress. These incentives also in many cases provide support for RLECs that lack scale and hence have lower efficiencies and higher costs than otherwise might be the case. Consequently, ICC should

be immediately capped and ultimately phased out as rapidly as feasible, as the "ABC Plan" recommends, in favor of the system of voluntary interconnection that underlies the Internet.[7] The size the fund should determine the rate at which broadband deployment will proceed.

Elements of the Broadband Ecosystem

The costs of providing broadband service fall into three distinct categories:

1. Backbone transport through high-capacity Internet facilities to other networks;

2. Middle Mile transport from aggregation points to internetwork exchange points;

3. First Mile local access networks that range from aggregation points such as PSTN central offices to the home or business.

Each of these service categories can be served by separate firms, and often are. As the comments of the INDATELgroup indicate, rural exchange carriers have finally begun to develop collaborative middle mile solutions for the mutual benefit of local service providers.[8] Such arrangements are commonplace in the broadband ecosystem, and are useful whether the first-mile service is fixed line telephony, broadband, or mobile.

[7] America's Broadband Connectivity Plan, "America's Broadband Connectivity Plan", 2011, http://americasbroadbandconnectivity.org/the-plan/.
[8] Max B. Huffman, "Delivering Efficiencies for Rural Local Exchange Carriers" (INDATELgroup, 2011), http://fjallfoss.fcc.gov/ecfs/document/view?id=7021693553.

Backbone Networks

The market for Internet backbones is fully competitive and does not require investment assistance or subsidy. The bottlenecks to providing universal broadband are below this tier of the ecosystem.

Middle Mile Networks

Middle mile facilities are a crucial element of broadband service, and the National Broadband Plan made a number of recommendations toward their extension, such as the anchor institutions proposal. They exhibit different economics than first mile networks, and are relatively immune to changes in the first mile. The primary need in the middle mile is for network infrastructure investment, specifically in trenches, poles, and optical fiber; middle mile operational costs are low compared to first mile networks. Lack of adequate middle mile broadband connectivity means that first mile networks in high cost areas are severely constrained in capacity. Consequently, the need in the middle mile is for investment assistance and regulatory streamlining rather than operational subsidy. There is robust competition in middle mile services today in densely-populated areas, and potential for competition in many other areas provided that regulatory and investment burdens are not too high.

First Mile Networks

First mile networks consume the lion's share of the current USF and ICC subsidies. Some argue that the bulk of this subsidy is unnecessary because satellite-based broadband covers virtually all of rural America and unsubsidized cellular and cable services cover

more than 95 percent.[9] Operational expenses for these technologies are lower than they are for the traditional long-loop copper pair telephone plant, and each is capable of providing broadband service of sufficient quality to support Voice over Internet Protocol (VoIP.)

The argument for first mile broadband subsidies is subtly different than the argument for POTS subsidies. In essence, satellite is an inferior broadband service for applications in which latency is a significant performance factor: gaming, video conferencing, and real-time interaction. This is because satellite-based broadband exhibits higher latencies than terrestrial networks – on the order of a half second round trip latency – and this latency degrades interactivity.

This doesn't mean that all forms of interactivity are impractical over satellite links: Communication satellites were originally built for trans-Atlantic telephony and are capable of providing clear VoIP services with modern echo cancellation technology. The most highly interactive applications are most strongly affected, however.

While extremely interactive applications are currently viewed as fringe features, it's likely that the element of interactivity will become more important to the mainstream applications of tomorrow.

The question that this dynamic raises for policy makers is whether it makes sense to make significant investment today for networks whose utility won't become apparent for some time, given that it becomes cheaper to deploy networks over time.

[9] Omnibus Broadband Initiative, "Connecting America: The National Broadband Plan" (Federal Communications Commission, March 2010), http://www.broadband.gov/plan/.

Satellite also has limited capacity, enough to connect any given household, but not enough to connect all of the seven million households the National Broadband Plan estimates to be unserved by wireline networks today.[10]

The logic of including satellite as an element of American broadband with respect to certain low-density, remote, high cost areas is inescapable. The National Broadband Plan found that the cost of extending wireline broadband to the most remote 250,000 housing units would be $14 billion, more than half its estimated $24 billion "broadband availability gap."[11] Other countries, such as Australia and Canada, have reached the same conclusion with respect to their very ambitious national broadband plans. Consequently, the hardest and most expensive-to-serve rural areas should be defined as satellite service areas for the time being, and within these areas – and only within them – low income individuals who would currently qualify for Lifeline/Linkup should be eligible to obtain a similar subsidy for satellite-based broadband service.

The benefit of terrestrial broadband becomes apparent as we define "rapid and efficient communication" more stringently. In contrast with satellite VoIP, terrestrial VoIP reduces the length of the typical call by several seconds because it does not inject a half-second delay between listening and talking. The question that this effect raises is how much this time savings is worth to the rate payers who subsidize USF. The answer lies in the cost/benefit determination concerning the overall size of the fund. The size of the fund is limited, and should be projected to decline over time. In any given year, the projects that

[10] Ibid.
[11] Ibid, p. 138.

offer the best cost/benefit factor should take priority over those that are less beneficial and more costly and at any time projects with high cost/benefit ratios should never be funded.

The overall goal of this plan is to stimulate investment in networks that will provide at least four Mbps broadband service at sub-250 millisecond latency to the share of Americans households without service whose costs of connection are not inordinately high. The goal is a moving target, however, as we would also like to extend low-latency service to more homes in the future.

There should also be no barrier to funding terrestrial wireless networks provided that wireless networks can achieve the national standard for broadband, 4 Mbps. This level of performance is well within the design parameters of 4G networks in operation today and being rolled out throughout much of the nation.

Reasonable Charges

In some instances USF is a reverse Robin Hood plan under which low-income urban dwellers with high living costs provide subsidies to rural dwellers that enjoy marvelous quality of life and the much lower living costs. The assumption that the Communications Act's goal of "reasonable charges" can only mean "equal charges regardless of cost" is unsound. It's perfectly reasonable for people who live in low cost rural settings to pay more for a given level of communication bandwidth that those who live in high cost, high-density urban areas because the reasonableness of a charge should be related to the cost of providing the service. People in urban areas normally pay more for car insurance

or groceries, but there is no program to mandate that reasonable charges in these cases be "equal" charges.

Broadband costs are a function of many factors, but the two largest are bandwidth and distance. Therefore, we urge the Commission to define "reasonable charges" in relation to "reasonable costs." For low income individuals in high cost areas, support for broadband should be available through a program similar in concept to Lifeline/Linkup.

Reasonable Performance

Similarly, the notion that everyone should be entitled to the same broadband performance is as unsound as the notion that all charges must be equal. Network performance is a function of the same factors that determine cost: Population density, proximity to Internet exchanges, and the age and capacity of installed equipment and cabling. People who live in high-rise Tokyo apartment buildings have the equivalent of a Ethernet exchange in the basement, which they can access with VDSL+ over a copper pair. For people who live in remote parts of Alaska, an equivalent Ethernet exchange is hundreds of miles away. Consequently, living choices mean that we aren't going to get the same level of performance without vastly unequal levels of subsidy, and the money simply is not there to normalize these factors. There is no equitable calculation that would justify the immediate provision of the finest fiber optic service to the most remote parts of the country at the expense of urban residents. However, as we note, this does not mean that most of the nation should not have "pretty good" broadband of at least 4 Mbps.

The Role of Technology

The twisted-pair copper networks that underlie POTS can provide broadband service of the requisite quality for less than a mile. After that, bandwidth drops off because signal strength attenuates and more noise is coupled into the cable. In rural America, many of the "first mile" cable runs are in fact as long as four miles. In these cases, providing broadband requires the installation of additional equipment and fiber optic or microwave backhaul. Other technologies are much less limited with respect to distance; terrestrial radio networks and cable TV networks can provide packet services over a span of 10 to 20 miles, with a level of service that's adequate for immediate and short term needs. Both cable and wireless require middle mile backhaul, of course, and their greater first mile coverage shifts their overall investment requirement to the middle mile. Consequently, there is no justification for continued subsidy of first mile twisted-pair copper networks where first mile services are available by cable or wireless capable of 4 Mbps speeds or above. In fact, new networks based on cable, fiber, or radio in rural settings are more efficient in terms of middle mile infrastructure improvement dollar-for-dollar than are new investments in existing POTS networks.

This is particularly important with respect to subsidies. If we conclude that urban grade terrestrial networks are so important to rural America that they must be provided instead of satellite, and we also conclude that rural Americans should pay no more for broadband than urban Americans, we're stuck with a very high ongoing subsidy regime. The lowest cost way to provide subsidies is with a reverse auction program in which potential providers bid for the right to provide subsidized services for a limited term. This should

only happen where an equivalent service (in terms of performance metrics, not of technology) is not available on unsubsidized terms.

The goal of rural broadband should be to provide the greatest number of Americans with broadband at the lowest cost, not to support the greatest number of marginal telephone companies. In many locales currently served by subsidized RLECs today, advanced 4G wireless can provide equal or better service for much lower cost, and there is every reason for USF 2.0 to embrace them.

Some commenters have suggested that subsidies should be "technology-neutral" in order to escape incumbent bias. We suggest that they should be "technology-aware" but with the twist that limited speed networks should be judged the least desirable technology.

Reverse Auctions

Having accounted for goals, technologies, and the tradeoffs between cost and benefits, we can proceed to design the mechanisms that enact the desired policies in the context of realistic tools. The most important mechanisms policy makers have to bring about universal broadband service is the funding pool and the system that disburses it. Today's USF is funded by contributions by rate payers in low service cost areas and distributed by a complex system of entitlements to RLECs. It would be more equitable to fund USF 2.0 directly from the Treasury, but changing the funding source exposes the program to risk. If the size of the fund is determined the Congressional budget, there will be temptation to make it a political bargaining chip. It's important to put this program on sound financial footing by insulating it from the variability of politics to the extent practical, even if

doing so requires us to accept its current inequity. Regardless of how the program is funded, monies should be dispensed by reverse auctions.

Reverse auctions can take place when an area is identified as unserved; this simply means that the only broadband service available in that area is a satellite service that fails to meet the standards we've articulated for capacity and latency and that the likely costs of service fall within the parameters of the subsidy limits. The USF administrator – the Universal Service Corporation – would issue a notice that a contract is to be let to provide broadband service in the area, and interested service providers may bid for that contract. The terms of the contract encompass the economic and service parameters of interest to USF 2.0:

1. The term of the contract, typically five years;
2. The minimum quality of service mandated in terms of capacity, latency, and reliability;
3. The cost to the consumer of the service;
4. Any other conditions that may apply.

A response to the bid would include a statement of the bidder's qualifications, financial soundness, the technology to be employed, and significant service restrictions and limitations, and of course the subsidy requested.

In evaluating these bids, the technology employed should be a tie-breaker that has interest only in the event of deciding between similar bids. A bidder who intends to extend fiber

would have priority over one that intends to make use of existing copper pairs, for example. There should be no bias toward or against any first mile technology, whether DSL, DOCSIS, 4G wireless, or something altogether new.

Reverse auctions would not be conducted in any area served by an unsubsidized service that meets the service criteria. In areas where an unsubsidized provider enters the market after an auction has been conducted, the contract let at auction will not be re-auctioned or renewed, but shall be allowed to run to term.

Reverse auctions should only be used to subsidize a single provider in a given area.

Conclusion

We believe that it's productive for the FCC to develop a new universal service plan to bring reasonable quality broadband to rural America consistent with the National Broadband Plan and the Communications Act. Rather than seeking to reform USF, the FCC should consider all of its current provisions as nothing more than candidate provisions. This is to say that the current USF should be zeroed out within five years and the future Plan should owe nothing to USF except those features that stand on their own merits.

USF 2.0 should fund network investment through low cost loans, reverse auctions pegged to the cost of deployment,) and a broadband adoption and use fund of limited duration. The overall goal of this plan is to stimulate investment in networks that will provide four Mbps broadband service at 250 millisecond latencies to 98 per cent of Americans in the near future, with greater capacity and lower latency possible in the future.

The primary differentiator of this Plan from USF is a renewed emphasis on the elements of "speed, efficiency, and reasonable charge" clearly articulated in the Communications Act and the emphasis on investment and reverse auctions to dispense funding.